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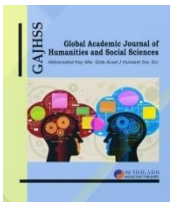

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Review Article

ChatGPT for Teaching, Learning and Research: Prospects and Challenges

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Abstract: The introduction of artificial intelligence in the field of education has resulted from the use of information and communication technologies as a tool for improving teaching and learning. Expert systems and machine intelligence have the potential to revolutionize education by providing personalized learning experiences, automating repetitive tasks, and allowing teachers to focus on more important tasks such as providing one-on-one attention to students. It is utilized in a range of educational applications, including adaptive learning systems that may change the complexity of content depending on a student's performance. This paper reviews literature on the educational implications of artificial intelligence. By evaluating some of ChatGPT's capabilities, the study evaluates the possibilities and limitations of OpenAI's ChatGPT for teaching, learning, and research. The results indicated that ChatGPT delivers rapid and instantaneous response to search queries, as well as automatic text production that resembles conversation response. The article also highlighted some of the difficulties experienced, such as a lack of citation and reference. The researcher suggested recommendations such as ensuring to cite and reference the replies supplied by ChatGPT.

Keywords: ChatGPT, Education, Research, Teaching, Learning, Plagiarism.

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INTRODUCTION

When one person communicates knowledge or abilities to another, the activity is often referred to as teaching. Imparting may refer to sharing experiences or transmitting knowledge, such as a lecture. Teaching is considered both an art and a science. As an art, it emphasizes the teacher's inventive and artistic qualities in creating a meaningful scenario in the classroom for pupils to learn. As a science, it provides light on the logical, mechanical, or procedural procedures that must be taken in order to ensure successful goal attainment. Varied educators have different perspectives on the notion of teaching. "Teaching is close interaction between a more mature personality and a less mature one which intends to advance the education of the latter (Rajagopalan, 2019). Teaching is learning as selling is to purchasing (Wallfisch & Wallfisch, 1979). Teaching is organization and management of a scenario in which there are gaps or impediments which a person will strive to overcome and from which he will learn in the process of doing so. Teaching is a sequence of acts meant to produce learning. Teaching is a type of influence aimed at influencing the behaviors potential another person". Smith expanded the definition of teaching in 1963 to include a system of actions involving an agent, an end goal, and a situation that includes two sets of factors: those over which the agent has no control (class size, pupil characteristics, physical facilities,

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etc.) and those over which he has control (such as teaching techniques and strategies).

Educational psychologists have defined learning in many ways and with various meanings. It has been defined as a quantitative growth in knowledge, including the memorization of information, abilities, and procedures that may be remembered and employed as needed. It is also seen as producing sense or abstracting meaning, linking pieces of the subject matter to one another and to the actual world, interpreting and grasping reality, and comprehending the world via reinterpreting information (Behlol & Dad, 2010). Learning is defined as a change in behavior caused by experience. In this concept, learning is seen as a function that maps experience onto behavior. To put it another way, learning is defined as the influence of experience on behavior (Houwe, Barnes-Holmes & Moors, 2013). Learning may be defined as permanent change since it is brought about in pupils by a teacher via tactics such as improving certain abilities, altering some attitudes, or comprehending specific scientific laws that operate within a learning environment (Muna & Kalam, 2021).

The phrase "Information and Communication Technology," abbreviated as "ICT," refers to the use of different types of technology to the management, processing, and transmission of information, as well as the facilitation of communication (Ratheeswari, 2018). It combines a wide range of tools and technology, such as personal computers, the internet, mobile phones, and other software packages.

Information and communications technology (ICT) plays a vital role in many aspects of our lives today, including education, commerce, healthcare, and entertainment. It enables us to gather information, preserve it, and share it with others, as well as facilitate real-time conversation with others (Opara, 2022). Information and communication technology also allows firms to perform more successfully and efficiently by automating activities, improving communication, and providing access to a wide range of information and resources. ICT is the driving force behind many of the technological breakthroughs that have led to the construction of the modern world, and it continues to play an important role in how we live, work, and interact with one another.

ICTs are causing rapid social transformation. They have an impact on many elements of life. The effects are becoming increasingly apparent in classrooms. Because ICTs provide both students and instructors additional options for tailoring learning and teaching to individual requirements, society is pressuring schools to react appropriately to this technological revolution. With the use of various technologies, ICT aids in keeping up with the current advances (Ratheeswari, 2018). Sharma *et al*., (2011) recognize the influence of ICT; CT allows self-paced learning using different resources such as assignments, computers, and so on, and as a consequence, the teaching learning industry has become more productive and meaningful. ICT facilitates the transaction between producers and users by keeping students informed and boosting teachers' capacity and skill by promoting live communication between the instructor and the student through e-mail, chat sessions, and so on. This encourages active learning, idea exchange, and conversation while also providing instant feedback. This triggers paced learning and enables for successful learning pathway mapping. This necessitates the availability of high-quality, useful digital information to both teachers and students. Teachers, in particular, should have up-to-date knowledge and abilities in order to employ new digital tools and resources to assist pupils in meeting high academic requirements. We absolutely need a vision to prepare our pupils for rising trends. The current high-tech and competitive society can only be sustained with ICT expertise. ICT has the ability to store, retrieve, and process e-content in a timely and correct manner. ICT is one of the most recent technological applications to teaching and learning processes. ICT in education has the potential to revolutionize instruction. This promise, however, may not be readily achieved, issues occur when instructors are asked to execute changes in what may well be unfavourable conditions (Ghavifekr *et al*., 2016). Given the significance of ICT in society and the future of education, identifying potential barriers to integrating these technologies in schools would be a significant step in improving the quality of teaching and learning. According to Balanskat, Blamire, and Kefala (2006), although teachers seem to recognize the importance of ICT in schools, they continue to face challenges in incorporating these technologies into their teaching and learning.

According to John McCarthy, the inventor of artificial intelligence, it is "the science and engineering of creating intelligent machines, particularly clever computer programs" (Tutorials Point, 2020). Artificial intelligence is a method of programming a computer, a computer-controlled robot, or software to think intelligently in the same way as intelligent people do. AI is achieved by understanding how the human brain works, as well as how people learn, decide, and operate when attempting to solve a problem, and then leveraging the results of this research to construct intelligent software and systems. The purpose of AI is to:

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1. Create Expert Systems: Intelligent systems that learn, show, explain, and advise their users.
2. Create Machines with Human Intelligence: Creating systems that comprehend, think, learn, and act like people.

Artificial intelligence, often known as machine intelligence, is intelligence exhibited by machines as opposed to natural intelligence demonstrated by humans and other animals (Saleh, 2019). It is intended to do tasks such as voice recognition, learning, planning, and problem solving.

Artificial intelligence is an emerging technology that has begun to alter educational tools and organizations. Education is an area in which instructors must be present in order to provide the greatest educational practice. The introduction of Artificial Intelligence alters the role of teachers, who are vital in the educational system. For measuring the pace of a certain person among others, AI mostly employs advanced analytics, deep learning, and machine learning. As AI solutions advance to a higher degree, they aid in identifying gaps in teaching and learning and increasing educational competency. AI can provide efficiency, personalization, and simplified activities, giving instructors the time and flexibility to give understanding and adaptation, which are distinctively human characteristics that computers cannot replicate. It is feasible to elicit the greatest outcomes from pupils by combining robots and professors (Kengam, 2020). Almost every aspect of our lives will be impacted by AI in the future, and among all of those, the education sector will be greatly influenced since teaching and learning are such important aspects of life, and the existing school system leaves much to be desired. Schooling in the past was not as adaptable as what AI in education would provide in the future. Teachers, who play the most significant function in the education system, are not scalable and are also costly. Teachers are overburdened with paperwork and devalued in certain nations. AI can assist each person individually by providing them a courses based on their interests and skill assessments. Verma *et al.,* (2019) reported that although AI may never be able to completely replace human grading, it is coming quite close. Teachers may already automate grading for almost all types of multiple choice and fill-in-the-blank tests, and automated grading of student work may not be far after. Today, essay-grading software is still in its infancy and isn't yet up to pace, but in college, grading assignments and examinations for big lecture courses may be time-consuming, even when TAs divide it among them. Even in lower grades, instructors often discover that grading consumes a substantial amount of time, time that might otherwise be spent interacting with students, preparing for class, or working on professional development.

CHATGPT

What is "CHATGPT"?

A chatbot is a software program that uses user input to simulate human-like interactions. The ChatGPT Chatbot was created by San Francisco-based OpenAI. On November 30, 2022; the Chatbot was made available for free public testing. Today, we will look at the GPT and attempt to figure out what it all means (Atuhaire, 2022). The Journal of India characterizes ChatGPT as a 'conversational' AI that would answer questions like a human—or so the promise and assumption goes. ChatGPT is an advanced Chatbot based on OpenAI's GPT technology. It is capable of handling a broad variety of text-based requests, ranging from basic queries and replies to more complicated jobs (Lund, 2022). OpenAI's ChatGPT is a big language model designed as a conversational agent. ChatGPT, as a big language model, is trained on vast volumes of data (Azaria, 2022). For example, if you need assistance writing a message to a colleague, ChatGPT can quickly develop a meaningful and well-written letter. Similarly, if you need to address a problem with a colleague's productivity but don't know what to say, ChatGPT can help. ChatGPT, with its enormous data warehouses and efficient architecture, can even author dissertations on themes such as the usefulness of artificial intelligence. This is ChatGPT's distinct value for academic researchers.

How does it work?

"ChatGPT model employs Reinforcement Learning from Human Feedback (RLHF), employing the same approaches as InstructGPT, but with subtle variations in the data gathering arrangement," according to OpenAI. We used supervised fine-tuning to train an initial model: human AI trainers offered dialogues in which they played both sides—the user and an AI assistant. We provided the trainers with model-written ideas to assist them in composing their replies. This new conversation dataset was combined with the InstructGPT dataset, which was converted into a dialogue format.

To build a reinforcement learning reward model, we required to gather comparison data, which comprised of two or more model replies graded by quality. We gathered this information by recording talks between AI trainers and the Chatbot. We chose a model-written phrase at random, sampled various potential completions, and had AI trainers score them. We may use Proximal Policy Optimization to fine-tune the model using these reward models. This method was repeated numerous times."

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LITERATURE REVIEW

Azaria (2022) highlights a startling ChatGPT prejudice towards the usage of digits in numbers. The researcher discovers a strong relationship between the frequency of digits created by ChatGPT and people' favorite numbers, with the most common digit generated by ChatGPT matching humans' most preferred number. He also discusses some of the benefits of ChatGPT being designed as a conversational agent, as well as some of its drawbacks.

Kengam (2020) explains how Artificial Intelligence can and is employed in the educational field. AIED is one of the presently expanding disciplines in educational technology, according to the 21st International Conference on Artificial Intelligence in Education held in 2020. The usage of AI is still unknown for educators in terms of how to utilize it for pedagogical purposes on a larger scale and how AI may effect teaching and learning in higher education. The researcher discussed the influence of AI on education, as well as its benefits and drawbacks. It also provides a particular method for developing an AI-enabled platform for education, as well as the consequences of AI in education.

Göçen and Aydemir (2020) investigated what possibilities are feasible with the entrance of AI in education and what consequences it might disclose for the future of schools. The study was created as a phenomenology study, a qualitative research approach that evaluated the perspectives of participants from various sectors. With the entrance of AI in education, schools and instructors will have new goods, advantages, and downsides, according to the findings. The results provide some recommendations for the usage of AI and the mitigation of possible difficulties. While most participants seem to have favorable attitudes about AI, there are some concerns about the future of education, particularly among teachers and academics. Lawyers and jurists are more concerned with the legal foundations for AI in education and potential challenges, while engineers view AI as a tool to improve quality and benefit everybody in the education sector.

Verma (2018) presents an overview of this technology and the extent of artificial intelligence in many domains, with a focus on its usage in education, as well as its meaning, searching strategies, innovations, and future.

Cope *et al*., (2020) provide some preliminary answers, first theoretically and then practically, in a review of the outcomes of many experimental implementations that have been recorded in more detail elsewhere. Our major result is that artificial intelligence will never "take over" the position of teacher in the setting of electronic computing techniques developed over the last three quarters of a century, since how it operates and what it accomplishes are so fundamentally different from human intelligence. However, given the constraints described in this work, it has the potential to revolutionize education in ways that, perhaps counterintuitively, make education more human, rather than less.

Van der Vorst and Jelicic (2019) investigated the role of educational AI applications in tailored learning. According to Bloom (1984), pupils who get one-on-one tutoring outperform those who learn via typical educational techniques by two standard deviations. Personalized one-on-one learning is often not societally practicable due to the restricted number of instructors and accompanying expenses. Breakthroughs in machine learning provide intriguing opportunities for assisting with individualized learning. AI may therefore be the "holy grail" in unlocking the promise of one-to-one learning by allowing apps to provide tailored instruction to each individual learner. From a socio-technical standpoint, we analyze the possible influence of AI on customized learning. As a result, we explore technology potential as well as any factors that may influence adoption, such as legal, social, and ethical considerations. Finally, we propose legislative solutions for encouraging the use of AI-driven customized learning applications.

Jain and Jain (2019) investigated how the notion of artificial intelligence may be implemented in teaching and learning in higher education, as well as the consequences of adopting AI in higher education. It investigates the learning consequences of rapidly changing technology on the techniques and scope of learning as well as teaching. AI enables higher education services to become freely available at an unprecedented rate, not just in the classroom but also outside of it. This paper seeks to determine how AI may become an important element of universities, as well as the immediate and long-term ramifications for several fields of higher education. The difficulties in adopting AI at these institutions were also investigated. This research will effectively give deep information for educators as well as in-depth understanding for educational model development, which will create prospects for future growth. Higher education colleges in Udaipur, Rajasthan, will be used for the purpose of study. Structured questionnaires were created, and data was collected using them, with the instructors' impression as the focus point. Frequency tables/graphs and one-way ANNOVA were used to

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analyze the acquired data in order to meet the study's goals. According to the study's findings, applying AI in higher education institutions significantly improves students' learning capacity, and AI has enormous future potential in the higher education sector.

CHATGPT AND ACCESS TO INFORMATION

ChatGPT as an AI powered tool that can facilitate access to information for students, searching for stuff on google might be a daunting task for many as student have to decide on an exact link to lookup the particular information. Let us compare the difference between google and ChatGPT.

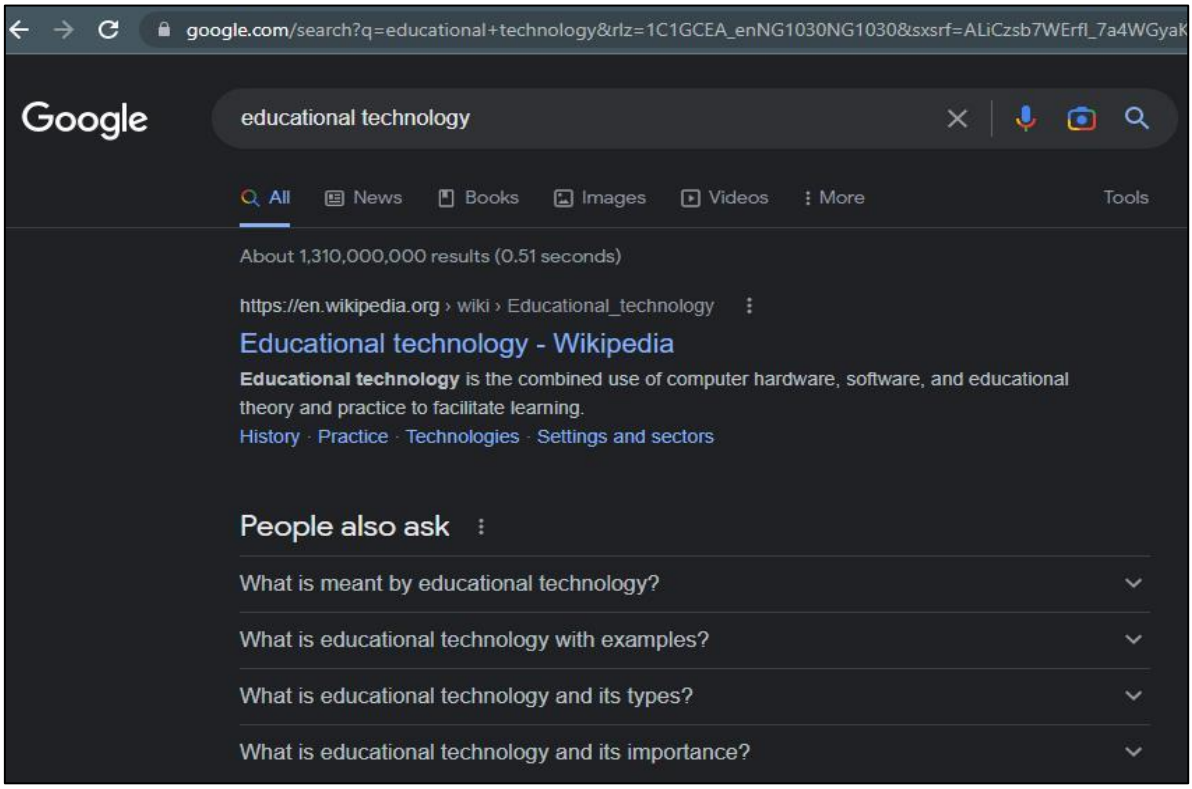

Figure 1: Google Search Page [All rights reserved]

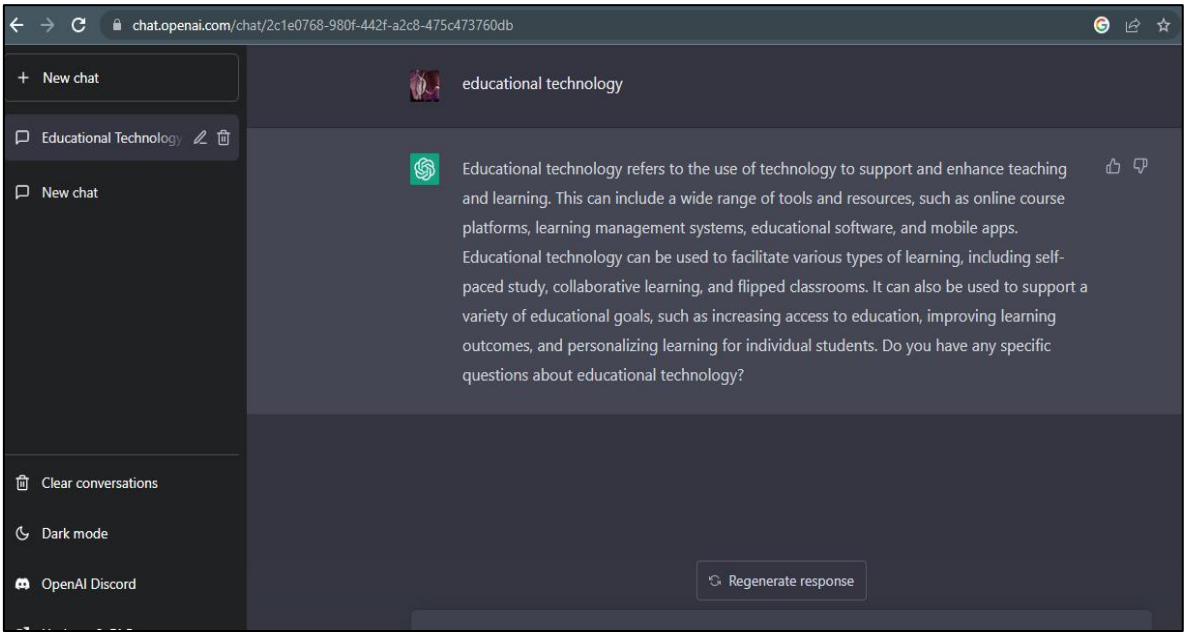

Figure 2: ChatGPT [All rights reserved; OpenAI]

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Google provides responses based on search results from specific websites, ChatGPT provides a direct response, it is like Chatting with a tutor. Google search results are based on websites that the Google algorithm has identified as relevant to your search query. In contrast, Chatbots like ChatGPT can provide direct responses because they have been programmed with a specific set of information and rules for generating responses. ChatGPT is a large language model trained by OpenAI, so it can provide responses to a wide range of questions on a variety of topics.

PROSPECTS OF CHATGPT

1. Quick and rapid response: The AI language model can respond quickly and immediately to inquiries and instructions.
2. Improving research

AI language models like as ChatGPT may be a valuable resource for academics in a range of domains. Here are some examples of how they might be utilized to improve research:

i. Natural language processing: By recognizing patterns and trends in the language used, AI language models may assist researchers in analyzing and comprehending vast volumes of text data, such as social media postings or news articles.

ii. Text generation: AI language models may be used by researchers to create realistic-sounding text, which can be valuable for tasks like machine translation or summarization.

iii. Data augmentation: Researchers may use AI language models to provide extra training data for machine learning models, which can assist enhance their performance.

3. Self-paced/Active learning: ChatGPT supports self-paced learners, and those who want to acquire a skill may get direct responses.

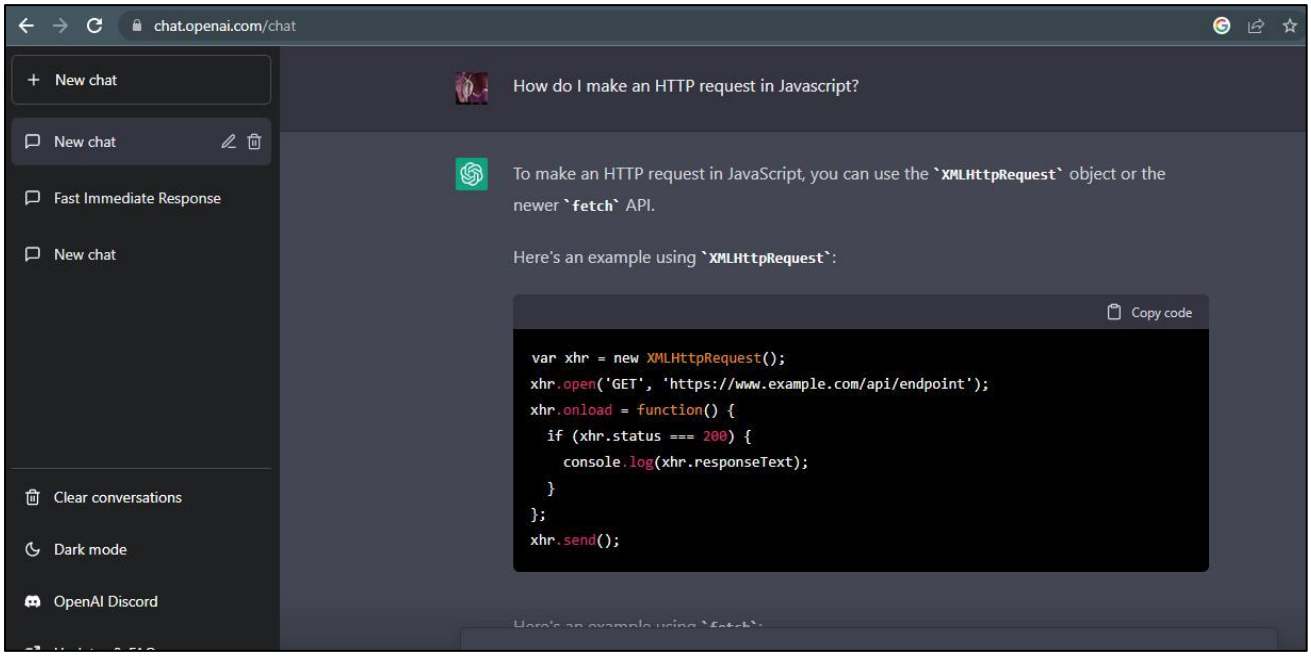

Figure 3: ChatGPT [All rights reserved; OpenAI]

From figure 3; Learners interested in programming can obtain direct answers using ChatGPT. The learners work at their own pace and practicalized what has been taught.

CHALLENGES

These are some of the limitations as confirmed by OpenAI

- ChatGPT sometimes writes plausible sounding but erroneous or illogical responses. Fixing this problem is difficult because: (1) there is currently no source of truth during RL training; (2) training the model to be more cautious causes it to decline questions that it can correctly answer; and (3) supervised training misleads the model because the ideal answer depends on what the model knows rather than what the human demonstrator knows.
- ChatGPT is sensitive to changes in input phrase or several attempts at the same question. For example, given one wording of a question, the model may claim ignorance, but with a little rephrasing, it can accurately respond.
- The model is often very verbose and overuses specific terms, such as repeating

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that it is an OpenAI-trained language model. These problems emerge because of biases in the training data (trainers favor lengthier responses that seem more thorough) and well-known over-optimization concerns.

- When a user submits an uncertain query, the model should offer clarifying questions. Instead, our existing models often infer what the user meant.
- While efforts are made to have the model reject incorrect requests, it may sometimes react to damaging instructions or display biased behavior. OpenAI is utilizing the Moderation API to warn against or ban specific forms of dangerous material, however we anticipate some false negatives and positives for the time being.

Besides some of these challenges as noted by OpenAI, the following are some other problems to be considered when using ChatGPT

1. Reliance on ChatGPT algorithm will stifle the creative mindset of the learner
2. The results produced by ChatGPT are not cited or referenced, hence this increases the chances of plagiarism.
3. Inaccurate responses are sometimes offered to learners.
4. Limited results with a small scope of responses to some questions asked.

CONCLUSION

This article revealed the concept of teaching and learning as critical to the life of an individual, the use of artificial intelligence plays a role in enhancing the teaching and learning process with the use of chatbots such as OpenAI's ChatGPT model which offers immediate and direct response to questions (queries) asked. Despite the advantages that ChatGPT offers, the cons must be addressed and taken into consideration.

RECOMMENDATIONS

1. Artificial intelligence can enhance teaching and learning but it should be a substitute.
2. Proper research should be carried out and not the total reliance on the responses offered by ChatGPT.
3. Due to the limited number of responses offered by ChatGPT, search engines are still a reliable too for research and should not be substituted/replaced.
4. Literary works should be cited and duly referenced, the content provided by ChatGPT are the works of authors/researchers/websites and not from thin air.

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